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To: Mr. P. Charlebois
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PICKERING NGS 1990 VACUUM BUILDING OUTAGE INSPECTION OF SEALANTS AND COATINGS

In May, 1990 the joint sealants and coatings inside the Pickering NGS vacuum building and pressure relief duct were inspected. The joint sealants had deteriorated in the main volume and EWST, and were replaced. Steel components exposed to the building atmosphere were corroded. In the main volume the metal sections were recoated with Tectyl 890 and in other areas coal tar epoxy or zinc primer was applied.

1.0 INTRODUCTION

To fulfill AECB licencing requirements for Pickering NGS the vacuum building was inspected during the month of May 1990. An inspection is held every ten years the last being in 1980/1/. This report discusses the findings of the Materials Science Section team who assessed the performance of coatings and joint sealants.

2.0 INSPECTION FINDINGS

2.1 Joint Sealants

Main Volume - Ground Floor 254'

The joint sealant in the floor construction joints was either blistered or severly softened. The adhesion to the concrete was poor and the sealant could be pulled out. The joint sealant (Sternson Duoflex NS polysulphide sealant) installed in 1980 appeared to be in a more deteriorated stage than the original sealant installed in 1971 (Figure 1).

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32-143-553	833.4	September 4, 1990	90-190-K

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EXECUTIVE SUMMARY

PICKERING NGS 1990 VACUUM BUILDING OUTAGE INSPECTION OF SEALANTS AND COATINGS

D.J. Stonkus

As part of an AECB licencing requirement the Pickering NGS vacuum building and pressure relief duct (PRD) were inspected. This report deals with the inspection results of the joint sealants and coatings. Significant deterioration of joint sealant had occurred in the main volume and emergency water storage tank (EWST) and all sealant was replaced. In the PRD 'A' side the hinge joint sealant was replaced. In the upper vacuum chambers sealant around the riser and downcomer pipes and a few construction joints were replaced. Steel components in the main volume and EWST were corroded and were cleaned and recoated with Tectyl 890 or coal tar epoxy. Epoxy zinc primer was used to touch up steel components in the PRD. It is recommended that an examination of the vacuum ducts be carried out during the next inspection to determine if the corrosion has increased. A research program should be initiated to evaluate the long term performance of the polyurethane sealant, installed as a replacement of the polysulphide sealant.

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Emergency Water Storage Tank

The joint sealant in the tank wall joints was brittle and could be pulled out. The wall sealant had not been replaced in 1980 but was the original installed sealant.

In the tank floor and between the downcomer flanges the sealant had been replaced in 1980. This sealant had reverted and was soft and mushy.

In the emergency water storage tank the Fiber Glass Reinforced Plastic (FRP) downcomer pipes are sealed using a silicone sealant. During the 1980 inspection nine of the fourteen downcomers were repaired due to loss of adhesion of the silicone to the FRP pipe. The silicone sealant was in good condition showing no signs of degradation, however, on 6 downcomers (L-4, L-8, L-9, L-11, L-13 and L-14) there were sections where poor adhesion was in evidence.

Remedial Action

All sealants in the main volume and the emergency water storage tank were replaced. The repair procedure consisted of the removal of the sealant from the joints, recutting the joint face by chipping and needle gunning, cleaning and drying the joint (Figure 2). The prepared joints were coated with Sikaflex 429 primer and sealed with Sikaflex 221 polyurethane sealant/2/.

The sealant around the FRP downcomer pipes was repaired by pulling out the silicone sealant from the affected locations, cleaning and abrading the FRP surfaces, and recaulking with GE RTV 102 silicone sealant (Figure 3).

Upper Vacuum Chambers

East Upper Chamber

The majority of the floor and wall construction joints were in good condition. The exception was in chamber No. 1 and No. 7 where the sealant was soft (Shore A2 Durometer less than 40). The sealant around the riser and downcomer FRP was soft, blistered with poor adhesion to the FRP pipes. The sealant in these areas was removed and replaced with Sikaflex 221.

West Upper Chamber

Sealant in five of the ten chambers had deteriorated. Shore A2 Durometer hardness measurements were in the 20-30 range, while good sealant should be in the 50 point range. Repairs were recommended in chambers No. 2, 3, 5, 7 and 10 numbered from South side. All sealants around the riser and downcomer FRP pipes were in poor condition and were replaced.

Main Roof and Building Exterior

Sealant on the roof was in good condition showing no evidence of excessive hardening or delamination.

Pressure Relief Duct (PRD)

Three types of joints were examined, construction, contraction and hinge joints.

The polysulphide sealant in the construction joints was in good condition. The Shore A2 hardness was in the 50-60 range.

The joint sealant in the PNGS-A hinge joints (No. 2, 8, 12, 16, 20 and 26) was removed and replaced with Sikaflex 221.

2.2 Protective Coatings

Main Volume

The galvanized steel instrumentation line support brackets were badly corroded and were subsequently replaced. Several carbon steel embedded parts carrying pipe flanges showed signs of corrosion (Figure 4). These sections had been previously coated with Tectyl 890. The old coating was scrapped off, wire brushed and again heavily coated with Tectyl 890/2/ (Figure 5).

Two vacuum ducts were examined from the main volume. It was found that the circumferential duct welds were rust covered and other rust spots were evident on the interior of the pipes. The exterior surface of the ducts contained blisters 12-25 mm in diameter. Some blisters contained water and rust was in evidence. No remedial action was deemed to be required at that time and none was taken.

Vacuum Building Basement

The majority of metal pipes which are exposed to the atmosphere showed surface corrosion. Water was also seeping through a wall cable penetrations and dripping on electric panel box 7171-P501. Pipes in this area were also badly corroded. Recommendations were made to clean the affected metal surfaces and to apply a protective coating.

Pressure Relief Duct (PRD)

There were minor indications of corrosion of the metal components in the contraction joints. Some bolts were replaced and other sections were wire brushed and touched up with a coating of zinc epoxy/2/.

Emergency Water Storage Tank

The hatch covers had been coated with coal tar epoxy. Although very little rust was found, all the covers were recoated with coal tar epoxy as per the procedure given in reference 2. The embedded parts around the downcomers were coated with Tectyl 890.

Vacuum Building Roof Seal Metallic Parts

Following removal of the old vacuum building roof seal, the embedded parts and the inside surfaces of the backup plates were inspected for corrosion and surface quality. The embedded parts, which were previously coated with a red primer had light surface corrosion. It was recommended to Pickering Operations that Corrosion was to be removed and coated with zinc epoxy (Figure 6). The rust was removed and recoated as per procedures given in reference 2.

2.3 Test Panels

One set of coating exposure panels installed in the east upper chamber was removed for laboratory examination and a separate report will be prepared.

A set is still remaining for further exposure. The results of the previous examination was reported by A.S. Williamson, Research Report No. C80-118-H, file 833.4, July 15, 1980.

3.0 CONCLUSION AND RECOMMENDATION

1. The high humidity and vacuum found in the vacuum building is extremely deleterious to the joint sealant. Preliminary evaluation of the Sikaflex shows that it has good moisture stability and is expected to perform well in the vacuum building. However, it is recommended that a program be initiated to evaluate long term performance of Sikaflex 221 under the vacuum building conditions. In addition, alternate sealants to Sikaflex should be evaluated to provide a second supply source.

2. It is recommended that the vacuum ducts be examined again during the next vacuum building inspection and provision made for possible remedial action.

4.0 ACKNOWLEDGEMENTS

The team members involved in the sealants and coatings inspection were: Don Stonkus, Richard Cabanus and Gopala Gowda.

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5.0 REFERENCES

1. "Pickering NGS 'A' Vacuum Building Inspection," Design and Development, Report No. 80383, December, 1980.

2. "Pickering Nuclear Generating Station, 1990 Station Outage Vacuum Building and Pressure Relief Duct Inspection Program," Pickering NGS CPS-N-20000-0004; April 20, 1990.

FIGURE 1

As Found Concrete Joint Sealant
In The Vacuum Building

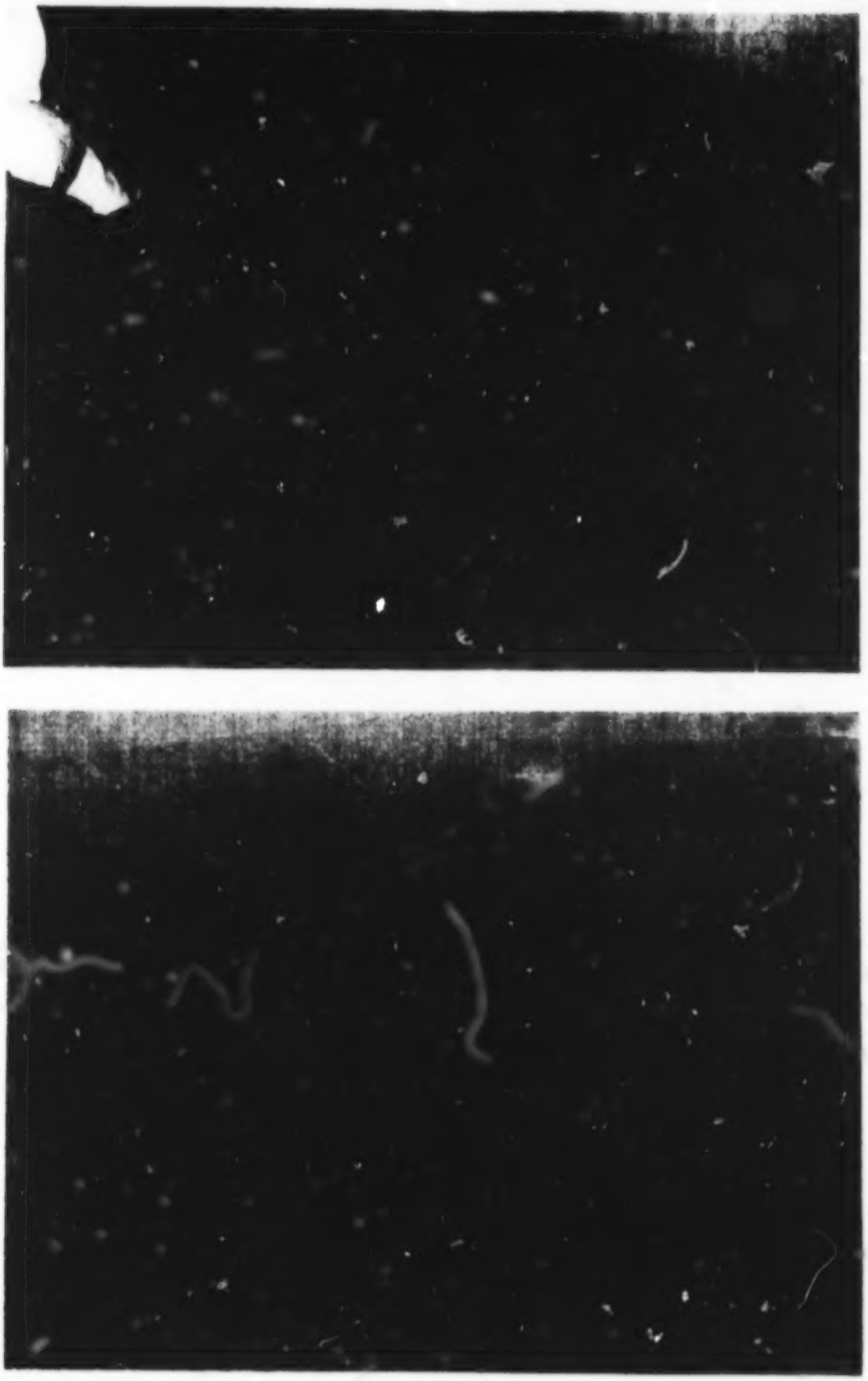

FIGURE 1 CONT'D

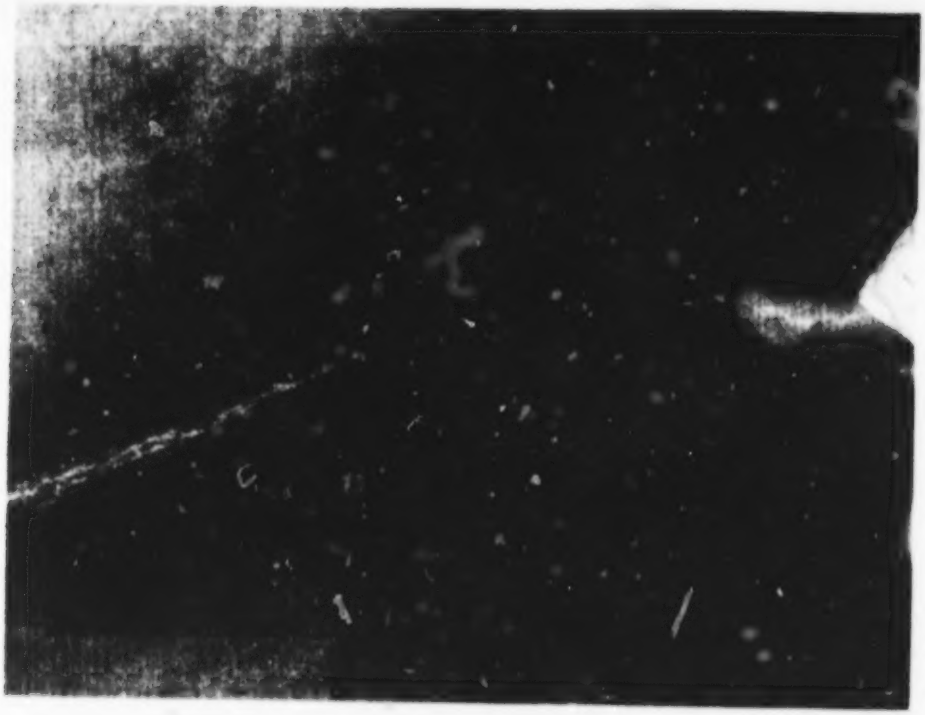

FIGURE 1 CONT'D

FIGURE 2

Repair of Concrete Joints
for Replacement with Sikaflex 221

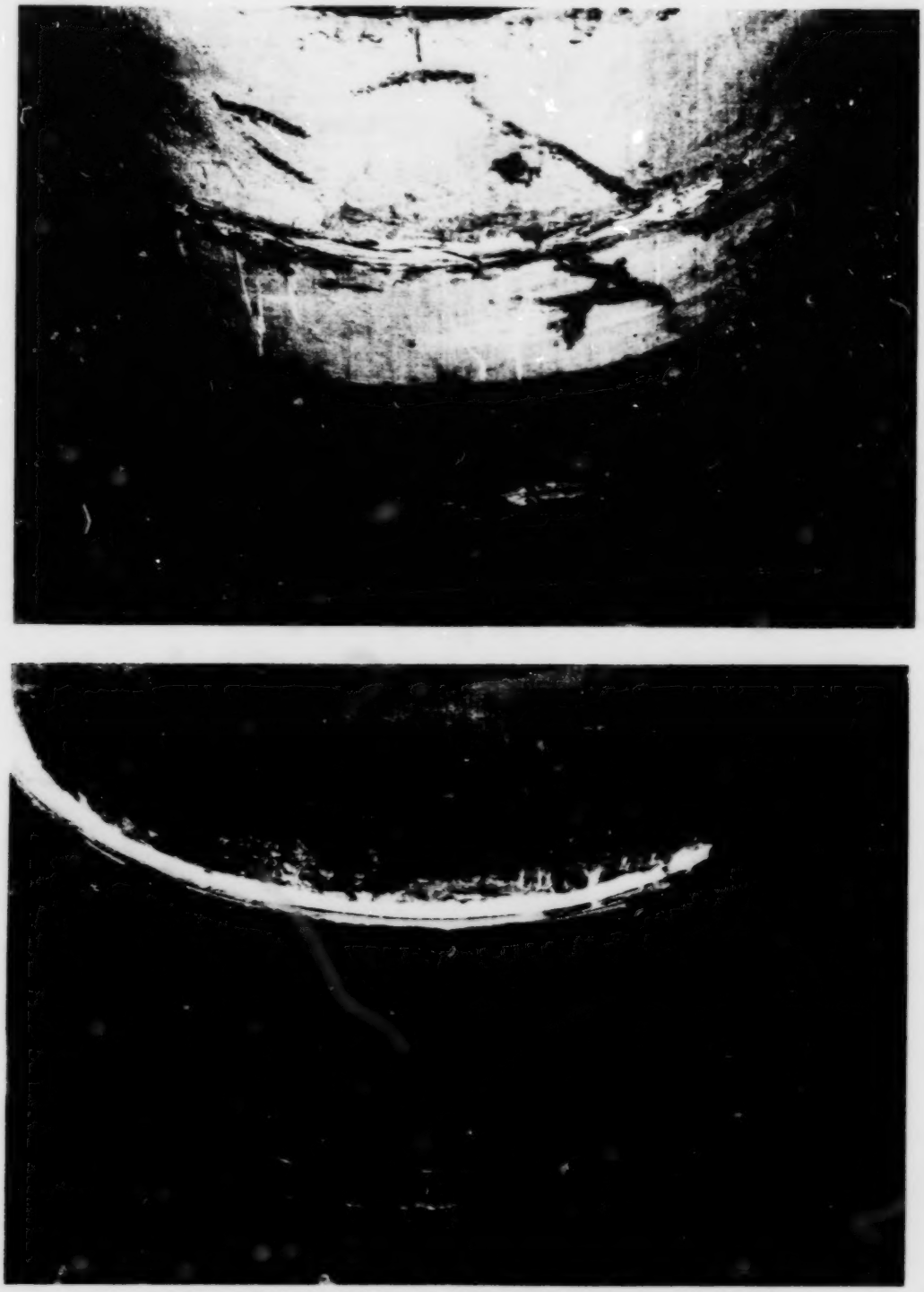

FIGURE 3

As Found and Repaired Silicone Sealant
and Caulking Around Downcomer

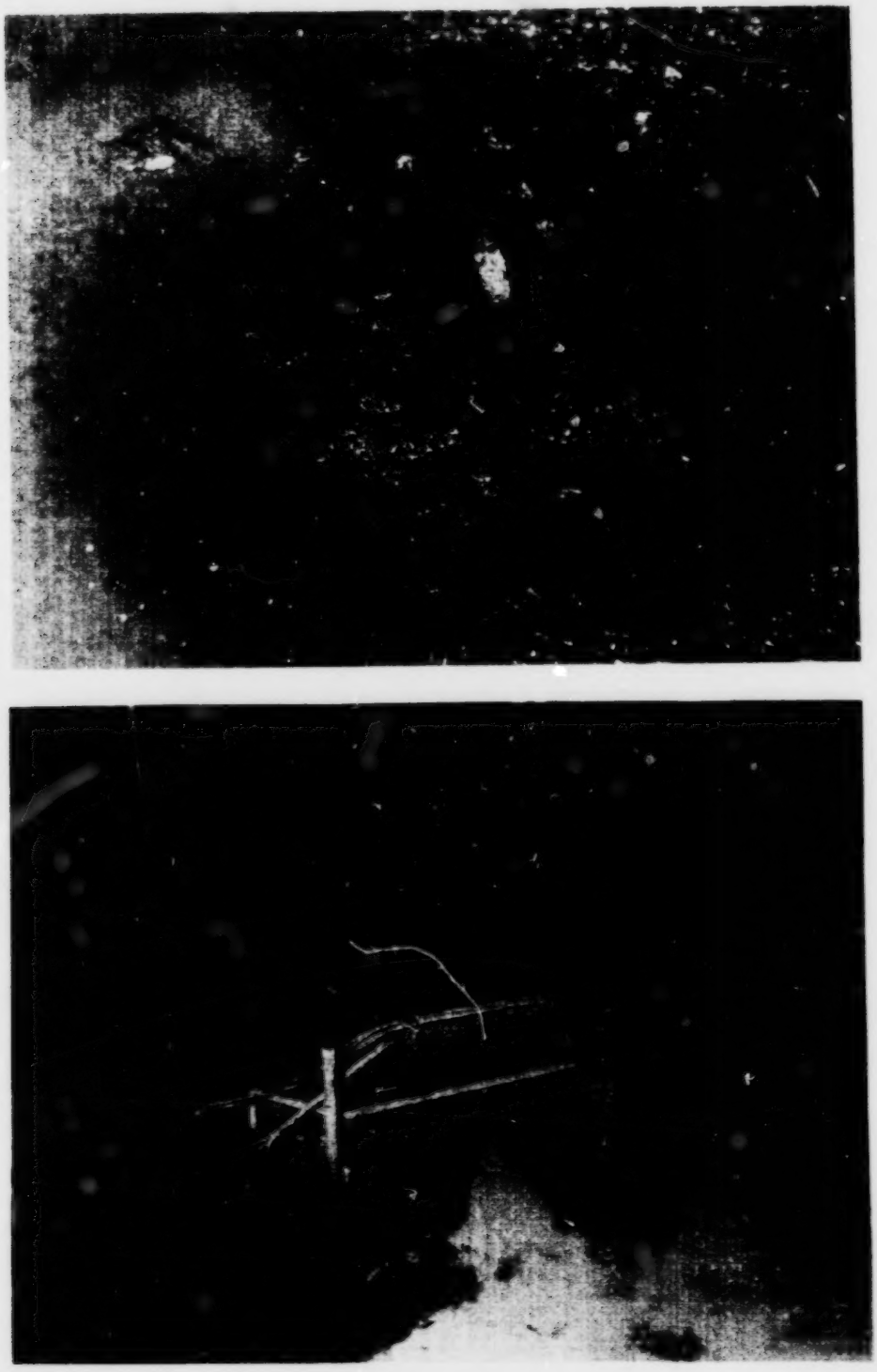

FIGURE 4

As Found Metallic Components
in the Vacuum Building

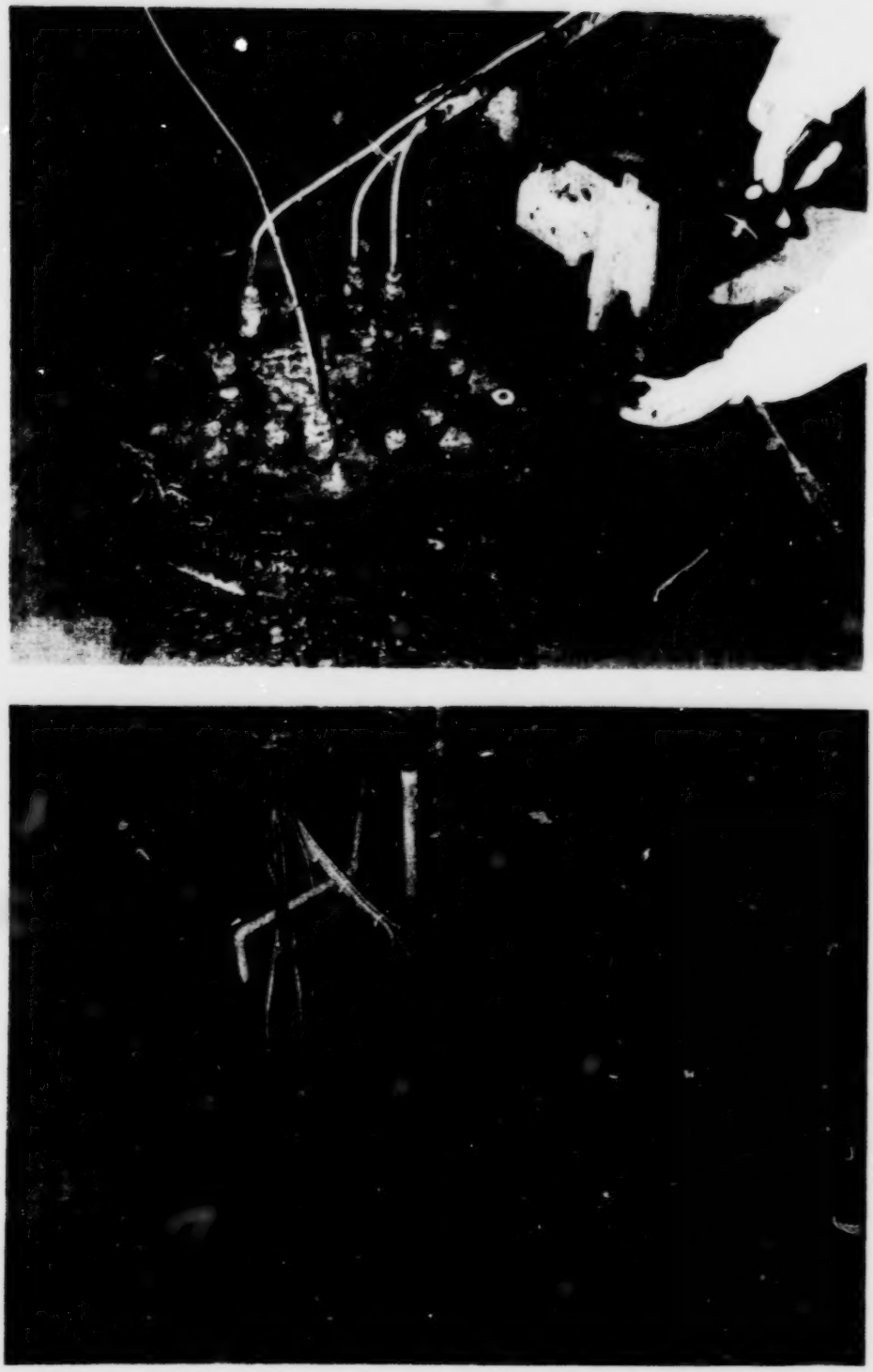

FIGURE 4 CONT'D

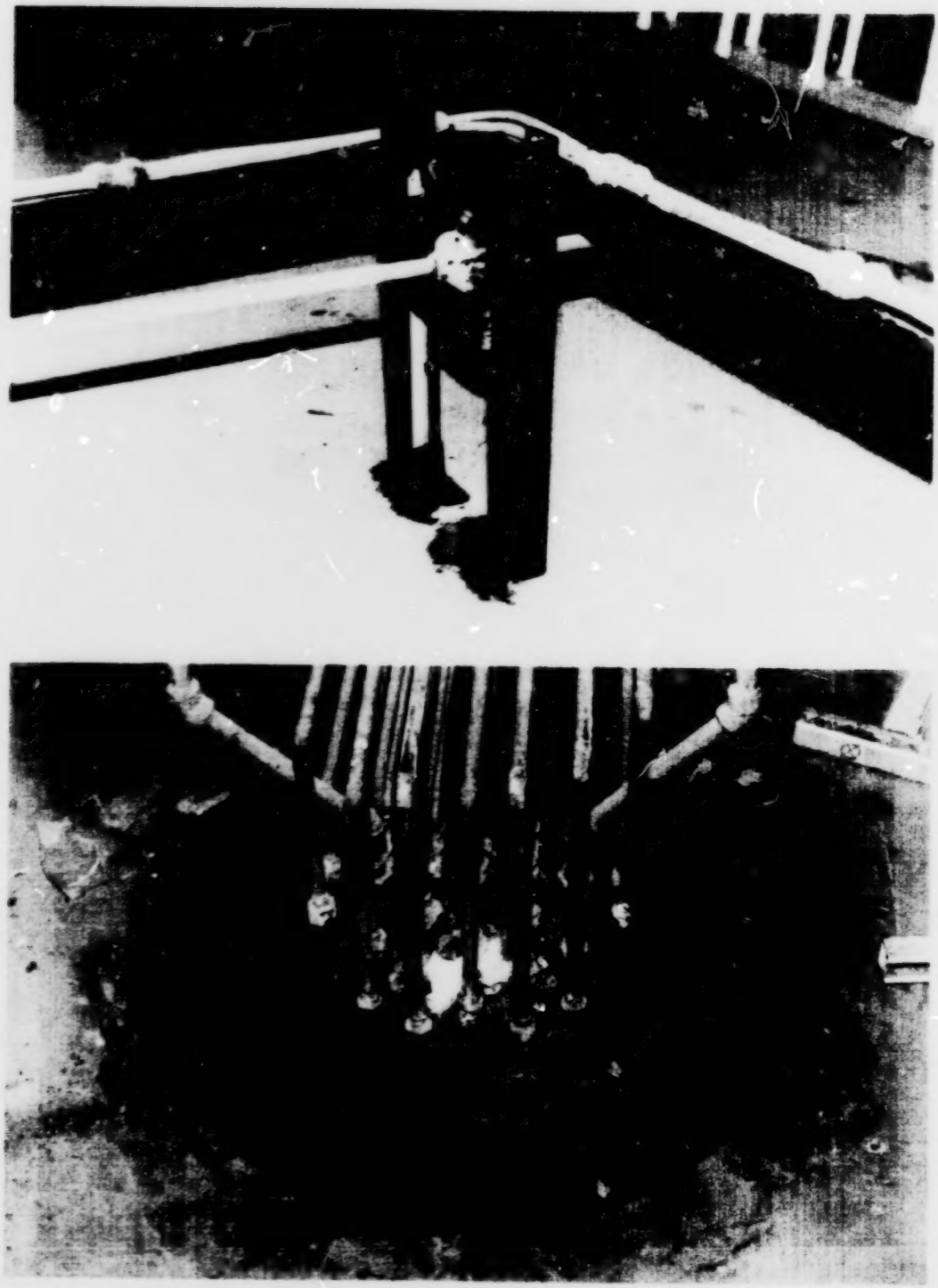

FIGURE 5

Repaired Metallic Parts
in the Vacuum Building

FIGURE 6

Recoated Vacuum Bilding
Roof Seal Backup Plates